The rejection further proffers that claims 5 and 32 are indefinite in the manner that the term "contains" is used. Claims 5 and 32 have each been amended to replace the term "contains" with "includes". One of skill in the art would readily recognize that the term contains and includes are synonyms. The term is fully supported by the specification and no new matter is added by virtue of the amendment. It is submitted that the metes and bounds of that which defines "includes" is sufficiently clear for purposes of 35 U.S.C. 112, second paragraph.

Accordingly, reconsideration of the rejections in light of the amendments leading to withdrawal of the rejection and allowance of the claims is respectfully requested.

Claims 2-5, 12, 32, 34 and 35 are rejected under 35 U.S.C. 112, first paragraph as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. The rejection proffers that the specification, as filed is not enabling for the method of determining useful values for the evaluation elements as claimed. As such, claims drawn to the use of evaluation elements are not enabled.

The rejection is respectfully traversed. It is submitted that the rejection fails to meet the fifth element of prima facie nonenablement as it relates to each of the listed elements. Specifically, the rejection fails to demonstrate that the claimed invention requires undue experimentation since multiple dominant factors related to the showing of undue experimentation have not been met. Such elements will be addressed separately below:

1. The rejection proffers that "E" is non-enabled value due to R_{KH} not being enabled (claim 2). That proffer is respectfully traversed. The factor "E" is defined in the specification as an empirical factor. See, page 12 line 24. Thus, this factor is derived from observation or experiment. Direction and guidance for obtaining a value for the factor "E" is presented in the specification, would not require undue experimentation, is rather predictable, and its use is illustrated in a working example.

The specification teaches at page 8 lines 14-19, that E is a factor that takes into account the proportionality of the actual glucose value in a projection period and the carbohydrate units that are effective in the projection period. Both the actual glucose values and effective carbohydrate units can be obtained without undue

experimentation. Actual glucose values can be measured from a patient and an example of the portion of effective carbohydrates is shown as the area described as A_2-A_1 in Figure 3. In light of the above, it is submitted that to derive the proportionality factor (E) from these easily determinable values would not require undue experimentation and is rather predictable.

It is submitted that the above is sufficient to demonstrate that the factor E is enabled. However, it further is noted that the specification specifically teaches that it is favorable to use $R_{KH}(F)$ as E, whereby F is a factor close to 0.25 mmol/l/g, and R_{KH} is the carbohydrate reduction factor. See, page 11 lines 16-18. Guidance is provided in the specification as to values for R_{KH} and F, as will be described in sections 2 and 3 below. Still further, the specification teaches at page 11, line 20 in Formula 9 that the insulin dose can be calculated based on Formula 9, which includes the factor "E".

Additionally, the factor E is specifically used in a working example. The working example, using this factor E is presented in the specification in figure 5 and page 15 beginning at line 15. Specifically, the insulin doses were calculated and administered in this example based on calculations using formula 9, which is set forth in the specification at page 12 line 20. The empty bars in figure 5 represent these insulin doses and administrations.

The specification is not required to teach every detail of the invention or to be a production specification. It need only explain how to make and use the invention without requiring an inordinate amount of experimentation. Accordingly, based on the guidance in the form of describing the factor E, in the form specific equations set forth in the specification, as well as the working example, it is submitted that undue experimentation would not be necessary to determine a value of E. Accordingly, the term "E" is believed to be enabled in accordance with 35 U.S.C. 112, first paragraph.

2. The rejection proffers that sufficient guidance in generating the "R_{KH}" value is not provided (claim 3). That rejection is respectfully traversed. R_{KH} is defined in the specification as a carbohydrate reduction factor that is used to reduce the effect of carbohydrates on blood glucose concentration. See, page 11 lines 17-19. Specifically, R_{KH} is a factor to model that not all the intaken carbohydrates are accounted for in the calculation of formula 8.

The Examiner's attention is again directed to Figure 3 where the portion of effective carbohydrates is shown as the area described as A_2-A_1. As shown in Fig. 3, some glucose flooding occurs before the time of glucose measurement t_a as well as

after the time to which the glucose concentration should be projected t_p. Accordingly, based upon Fig. 3, it is understood that by including the whole amount of incorporated carbohydrates, their effect on a later glucose concentration may be over-estimated. Further, based on Fig. 3, it is submitted that the glucose reduction factor R_{KH} is predictable and that one skilled in the art could readily determine it without undue experimentation. In addition to Fig. 3, the specification provides guidance as to R_{KH} at page 11, line 17 where the factor "E" is chosen as $R_{KH}(F)$.

The specification is not required to teach every detail of the invention or to be a production specification. It need only explain how to make and use the invention without requiring an inordinate amount of experimentation. Therefore, based upon guidance provided in the specification, it is submitted that undue experimentation would not be necessary to determine a value for the term R_{KH}. The test of enablement is not whether experimentation is necessary, but if experimentation is undue. Here, the experimentation necessary to determine a value of a carbohydrate reduction factor is straightforward and predictable. Accordingly, the term R_{KH} is believed to be enabled in accordance with 35 U.S.C. 112, first paragraph. Claims 3-5, 32, 34, and 35 depend from claim 2.

3. The rejection proffers that the value determination of the empirical factor F is not enabled (claim 3). This proffer is respectfully traversed. As discussed above, and as shown in Fig. 3, it is understood that by including the whole amount of incorporated carbohydrates, their effect on a later glucose concentration may be over-estimated. Thus, it is favorable to use R_{KH} (F) as E. It is submitted that in determining F, the specification guides one skilled in the art to examine Figure 3, and to use its teachings to calculate the carbohydrate reduction factor, and to use that factor to determine "E". The factor "F" may be used in this determination, where the specification teaches that it is close to 0.25 mmol/l/g.

The rejection proffers that Applicant is improperly reading the limitations of the specification into the claims. It is submitted that the term "close" is not claimed, nor is the value 0.25 mmol/l/g. The stated value of "F" is brought to the Examiner's attention to demonstrate the guidance and direction that is specifically presented in the specification to one skilled in the art to determine its empirical value.

The specification is not required to teach every detail of the invention or to be a production specification. It need only explain how to make and use the invention without requiring an inordinate amount of experimentation. Based upon the guidance

provided in the specification, it is submitted that undue experimentation would not be necessary to determine a value for the term F. Accordingly, the term F is believed to be enabled in accordance with 35 U.S.C. 112, first paragraph.

4. The rejection proffers that the value of *m* of the summation lacks any definition and thus is not enabled (claim 12). That proffer is respectfully traversed. Direction and guidance as to determination of a value for *m* is set forth at page 8 by formula 4. It is described that the factor "KH_j" takes into account the consumption of carbohydrates at numerous points in time as well as a quantity of carbohydrate units consumed each time. The term "m" is a summation index (as shown by its position within the formula), which indicates that the summation is made from j=1 to j=m, while "m" is an integer referring to the last consumption of carbohydrate that is taken into account. This way of indicating a summation of summation factors is common in mathematics.

The description below formula 4 reciting that "the consumption of carbohydrates at numerous points in time" is considered, explains to the artisan which summation factors are taken into account. Therefore the value of "m" would be clear to the artisan. Thus, it is submitted that sufficient guidance and direction as to the determination of a value for *m* is provided to one skilled in the art. Accordingly, *m* is believed to be enabled in accordance with 35 U.S.C. 112, first paragraph.

In light of the above, reconsideration of the rejections, leading to withdrawal of the rejection and allowance of claims 2-5, 12, 32, 34, and 35 is respectfully requested.

Claims 1, 7-10, 36 and 37 are rejected under 35 U.S.C. 102(b) as being anticipated by Worthington et al (US Patent No. 5,822,715). Worthington et al. discloses a diabetes management system for predicting a future blood glucose value of a patient and for recommending a corrective action to the patient when the future blood glucose value lies outside of a target range.

Claim 1 recites that its system comprises "the same or a second data input device for entering carbohydrates (KH_j) consumed or to be consumed, and their times of consumption (t_j)". The apparatus 10 of Worthington et al. does not include such a device. The only information regarding carbohydrates that apparatus 10 is formed to receive relates to the carbohydrate value C, which indicates the amount one gram of carbohydrates is expected to raise the patient's blood glucose concentration. See, column 8 lines 13-15. The value C is <u>not</u> related to carbohydrates consumed or to be

consumed, but rather it is a value that it is selected in dependence upon the patient's weight. See, column 10 lines 11-15. Further, the specification teaches at column 15 lines 37-40, that it is the patient that estimates the insulin required by the meal consumed and that the patent uses apparatus 10 to record "the dose value, dose type, and time of injection". There is no description or suggestion in Worthington et al. of a device for entering carbohydrates consumed or to be consumed, much less their times of consumption.

Further, claim 1 recites a system that comprises "a memory unit for storing . . . carbohydrates consumed and their times of consumption". The apparatus 10 of Worthington et al. does not receive inputted information regarding carbohydrates consumed and their times of consumption. Further, Worthington et al. fails to disclose or suggest storing information regarding carbohydrates consumed and times of consumption.

The Examiner's attention is directed to the specification of Worthington et al., which teaches that its memory 24 is suitable for storing a series of specific information. In particular, memory 24 stores maximum and minimum values defining a target blood glucose range; a target blood glucose value T; an insulin sensitivity value S; a carbohydrate value C; a hypoglycemic value H; information for determining an insulin action value F_k. (t_d); the computer program of the microprocessor 22; blood glucose values of the patient; the insulin dose values; the insulin types; the parameter values used by microprocessor 22 to calculate future blood glucose values, supplemental insulin doses, and carbohydrate supplements; maximum value R_{max}, minimum value R_{min}; and the table values for determining remaining insulin action at corresponding times after injection; an adjusted insulin sensitivity value; new maximum and minimum values defining the patient's target blood glucose range; a new target blood glucose value; and new insulin action table values for determining remaining insulin action. See for example, Col. 4 lines 13-20, Col. 6 lines 47-48 and 62-66, Col. 9 lines 52-57, and Col. 11 lines 31-35. Again it is noted that the carbohydrate value C is <u>not</u> related to carbohydrates consumed, but rather is a value selected in dependence upon the patient's weight. See, column 10 lines 11-15.

Still further, claim 1 recites that its system comprises "an evaluation device for . . . extrapolating a glucose concentration . . . the extrapolation comprises the following steps: . . . determination of the portion (KH_{wirk}) of carbohydrates consumed

that take effect in the interval between t_a and t_p, and determination of an extrapolated glucose concentration G_p at the point in time using I_{wirk} and KH_{wirk}". Worthington et al. lacks such an evaluation device.

As discussed above, Worthington et al. fails to describe or suggest an apparatus formed to enter carbohydrates consumed or to be consumed or to enter the times of carbohydrate consumption. Further, its apparatus fails to include a memory that stores the carbohydrates consumed and times of consumption. Accordingly, it is submitted that Worthington et al. cannot be said to have an evaluation device for conducting an extrapolation with information that it is does not possess.

As such, claim 1 is not anticipated by Worthington et al. Claims 7-10 and 36-37 depend from claim 1. Reconsideration of the rejection, leading to its withdrawal and allowance of the claims is respectfully requested.

Claims 1, 6-10, 36 and 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Worthington et al. as applied to claims 1, 7-10, 36 and 37 above, and further in view of Conn et al. (WO 00/47109; 2000). Conn et al. at discloses a monitoring system used for extracting small amounts of a target analyte from the biological system, and then sensing and/or quantifying the concentration of the target analyte. See, page 4 lines 13-15.

Arguments distinguishing claim 1 from Worthington et al. have been presented above. Conn et al. fails to cure the inadequacies of Worthington et al. Specifically, Conn et al. fails to disclose or suggest a system that comprises "an evaluation device for evaluating the data stored in the memory unit and extrapolating a glucose concentration at a point in time (t_p)". Still further, Conn et al. fails to describe or suggest a system where "the extrapolation comprises the following steps: determination of the portion (I_{wirk}) of insulin doses that take effect within the interval between t_a and t_p, determination of the portion (KH_{wirk}) of carbohydrates consumed that take effect in the interval between t_a and t_p, and determination of an extrapolated glucose concentration G_p at the point in time tp using I_{wirk} and KH_{wirk}", as required by claim 1. At most, Conn et al. discloses a monitoring system having at least two components employed in order to allow separation of data collection from data processing and display.

Accordingly, it is respectfully submitted that Conn et al. fairly considered for all that it teaches, does not contain the requisite suggestion or incentive that would have motivated the skilled artisan to modify Worthington et al. to meet the

requirements of claim 1, that being a system comprising "a data input device for entering insulin doses administered (I_i) and their times of administration (t_i), the same or a second data input device for entering carbohydrates (KH_j) consumed or to be consumed, and their times of consumption (t_j), a unit for determining the actual glucose concentration (G_a) in a patient's bodily fluid at a specific point in time (t_a), a memory unit for storing administered insulin doses and their times of administration, and carbohydrates consumed and their times of consumption, an evaluation device for evaluating the data stored in the memory unit and extrapolating a glucose concentration at a point in time (t_p), whereby t_p is after t_a, and the extrapolation comprises the following steps: determination of the portion (I_{wirk}) of insulin doses that take effect within the interval between t_a and t_p, determination of the portion (KH_{wirk}) of carbohydrates consumed that take effect in the interval between t_a and t_p, and determination of an extrapolated glucose concentration G_p at the point in time tp using I_{wirk} and KH_{wirk}." Claims 6-10, 36, and 37 depend from claim 1.

Since the teaching or suggestions, as well as the expectation of success, must come from the prior art and not applicant's disclosure, it is respectfully submitted that Worthington et al. and Conn et al. either alone or in combination with one another fail to suffice to establish a *prima facie* case of obviousness of the invention as claimed by claim 1 under 35 U.S.C. 103(a). It is respectfully contended that the claimed invention meets the test of patentability under 35 U.S.C. 103(a). Accordingly, reconsideration of the rejection of claims 1, 6-10, 36 and 37 leading to withdrawal of that rejection and allowance of the claims is requested.

The claims are believed to be in condition for allowance, and allowance of the application is respectfully requested. It is requested that this paper be considered a Petition for Extension of time sufficient to effect a timely response, and that all fees due be charged to Deposit Account Number 50-0877 with reference to (RDID 0006 US).

Respectfully submitted,
The Law Office of Jill L. Woodburn, L.L.C.

Nov. 22, 2002
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Version with Markings to Show Changes Made

1. (Amended) System for the extrapolation of a glucose concentration, comprising:

a data input device for entering insulin doses administered (I_i) and their times of administration (t_i),

the same or a second data input device for entering carbohydrates (KH_j) consumed or to be consumed, and their times of consumption (t_j),

a unit for determining the actual glucose concentration (G_a) in a patient's bodily fluid at a specific point in time (t_a),

a memory unit for storing administered insulin doses and their times of administration, and carbohydrates consumed and their times of consumption,

an evaluation device for evaluating the data stored in the memory unit and extrapolating a glucose concentration at a point in time (t_p), whereby t_p is after t_a, and the extrapolation comprises the following steps:

determination of the portion (I_{wirk}) of insulin doses that take effect within the interval between t_a and t_p,

determination of the portion (KH_{wirk}) of carbohydrates consumed that take effect in the interval between t_a and t_p, and

determination of an extrapolated glucose concentration G_p at the point in time tp [with consideration for] using I_{wirk} and KH_{wirk}.

5. (Twice Amended) System according to Claim 2, in which X, as the addend, [contains] includes the quantity SG(A), whereby SG is the slope of the glucose concentration at the point in time t_a, and A is an empirical weighting factor.

32. (Twice Amended) System according to Claim 4, in which X, as the addend, [contains] includes the quantity SG (A), whereby SG is the slope of the glucose concentration at the point in time ta, and A is an empirical weighting factor.

Clean Version of Replacement Claims for Entry During Prosecution of U.S. Application No. 09/711,855

1. (Amended) System for the extrapolation of a glucose concentration, comprising:

a data input device for entering insulin doses administered (I_i) and their times of administration (t_i),

the same or a second data input device for entering carbohydrates (KH_j) consumed or to be consumed, and their times of consumption (t_j),

a unit for determining the actual glucose concentration (G_a) in a patient's bodily fluid at a specific point in time (t_a),

a memory unit for storing administered insulin doses and their times of administration, and carbohydrates consumed and their times of consumption,

an evaluation device for evaluating the data stored in the memory unit and extrapolating a glucose concentration at a point in time (t_p), whereby t_p is after t_a, and the extrapolation comprises the following steps:

determination of the portion (I_{wirk}) of insulin doses that take effect within the interval between t_a and t_p,

determination of the portion (KH_{wirk}) of carbohydrates consumed that take effect in the interval between t_a and t_p, and

determination of an extrapolated glucose concentration G_p at the point in time tp using I_{wirk} and KH_{wirk}.

2. System according to Claim 1, in which the glucose concentration G_p is determined at the point in time using the following formula:

$$G_p = G_a - I_{wirk}(D)(SE) + KH_{wirk}(E) + X,$$

whereby D is an empirical weighting factor, SE is the patient's insulin sensitivity, E is a factor, and X=0 or is unequal to zero.

3. System according to Claim 2, in which $E = R_{KH}(F)$, whereby R_{KH} is the carbohydrate reduction factor and F is an empirical factor.

4. System according to Claim 2, in which X, as the addend is equal to GB, whereby $GB = I_{basal}(SE)(C)$ and I_{basal} is the patient's basal insulin demand over 24 hours, SE is the patient's insulin sensitivity, and C is an empirical weighting factor.

5. (Twice Amended) System according to Claim 2, in which X, as the addend, includes the quantity SG(A), whereby SG is the slope of the glucose concentration at the point in time t_a, and A is an empirical weighting factor.

6. System according to Claim 1, in which the unit used to determine the actual glucose concentration G_a is a microdialysis device.

7. System according to Claim 1 that also includes a display unit for displaying the extrapolated glucose concentration G_p.

8. System according to Claim 1 that also includes a warning unit that emits a warning signal when the extrapolated glucose concentration G_P is outside a selected normal range.

9. System according to Claim 1 in which the user enters the carbohydrate units consumed (KH_j).

10. System according to Claim 1 in which the system contains a control unit for an insulin infusion device or is connected to such a device, and in which the insulin doses administered (I_i) and their times of administration (t_i) are transmitted from the control unit to the date input device for entering insulin doses.

12. (Amended) System according to Claim 1 in which the quantity of carbohydrates consumed (KH_{wirk}) that takes effect in the period between t_a and t_p is calculated using the following formula

$$KH_{WIRK} = \sum_{j=1}^{m} \int_{t_a}^{t_p} C_{KH}(t)dt\,(KH_j)$$

whereby C_{KH} represents the quantity of carbohydrates that are bioavailable at the point in time t and therefore represents the carbohydrate flooding profile, with

$$\int_0^{\infty} C_{KH}(t)dt = 1.$$

32. (Twice Amended) System according to Claim 4, in which X, as the addend, includes the quantity SG (A), whereby SG is the slope of the glucose concentration at the point in time ta, and A is an empirical weighting factor.

33. System according to claim 1 in which the portion of insulin doses (I_{wirk}) that take effect in the period between t_a and t_p is calculated using the following formula

$$I_{WIRK} = \sum_{}^{n} \int_{}^{t_p} C_I(t)dt\,(I_i);\ n = \text{number of insulin doses to be considered}$$

$i=1 \quad t_a$

whereby CI represents the quantity of insulin that is bioavailable at the point in time t and therefore represents the insulin effectiveness profile; with

$$\int_0^{\infty} C_I(t)dt = 1.$$

34. System according to claim 2 in which the portion of insulin doses (I_{wirk}) that take effect in the period between t_a and t_p is calculated using the following formula

$$I_{WIRK} = \sum_{i=1}^{n} \int_{t_a}^{t_p} C_I(t)dt\,(I_i);\ n = \text{number of insulin doses to be considered}$$

whereby CI represents the quantity of insulin that is bioavailable at the point in time t and therefore represents the insulin effectiveness profile; with

$$\int_0^{\infty} C_I(t)dt = 1.$$

35. System according to Claim 2 in which the quantity of carbohydrates consumed (KH_{wirk}) that takes effect in the period between t_a and t_p is calculated using the following formula

$$KH_{WIRK} = \sum_{j=1}^{m} \int_{t_a}^{t_p} C_{KH}(t)dt(KH_j)$$

whereby C_{KH} represents the quantity of carbohydrates that are bioavailable at the point in time t and therefore represents the carbohydrate flooding profile, with

$$\int_0^{\infty} C_{KH}(t)dt = 1.$$

36. System according to Claim 1, in which the point in time t_p is from 0.5 to 5 hours after t_a.

37. System according to Claim 1, in which the point in time t_p is at least 2 hours after t_a and up to 4 hours after t_a.